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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/007,904	10/31/2001	H. Scott Fetterman	7-17	3045

7590

09/30/2003

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EXAMINER

PERT, EVAN T

ART UNIT

PAPER NUMBER

2829

DATE MAILED: 09/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/007,904

Applicant(s)

FETTERMAN ET AL.

Examiner

Evan Pert

Art Unit

2829

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 June 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-41 is/are allowed.
- 6) ☒ Claim(s) 42 and 43 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 August 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Graas et al. (U.S. 6,570,181).

Graas et al. disclose a stress test migration device (title + cover figure), comprising: a conductive runner 12, the conductive runner 12 having a length sufficient to develop axial stress above a threshold for nucleating voids for a technology in which the runner is fabricated (col. 1, lines 28-31 taken with col. 2, lines 28-31), wherein the conductive runner 12 is part of a chain of conductive runners 12 and 14 that serpentine back and forth boustrophedonically.

Graas et al. does not explicitly disclose that an individual runner 12 serpentine back and forth, but suggests that the "the layout of the long and short connecting links may take advantage of available real estate on a wafer and may be conformed thereto" [col. 2, lines 44-46].

A serpentine arrangement for a conductive line is well known to "conserve real estate" [col. 2, line 42].

It would have been obvious to one of ordinary skill in the art at the time of the claimed invention to modify the straight runners 12 to be serpentine, motivated to "conserve real estate" as is taught by Graas et al..

3. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Graas et al. in view of Hoang et al. (1991 IEEE).

Graas et al. disclose a stress test migration device (title + cover figure), comprising: a conductive runner 12, the conductive runner 12 having a length sufficient to develop axial stress above a threshold for nucleating voids for a technology in which the runner is fabricated (col. 1, lines 29-31 taken with col. 2, lines 28-31), wherein the conductive runner is "formed with the same semiconductor fabrication process and technology as the metal interconnect being tested for electromigration and void stress" [col. 2, lines 28-31].

Graas et al. does not teach that the metal interconnect being tested "is comprised of two conductive materials providing parallel conduction paths of different impedances."

Hoang et al. discloses test structures for testing of TiN/Al-Si-Cu interconnects that inherently have two parallel paths of different materials. While Hoang et al. were not able to detect voiding (Table 2), the intent of Hoang et al. was to determine if voiding occurred by incorporating the process technology under investigation into a test structure for determining stress voiding. They found no defects for the technology under test (Table 2).

Yet, it would have been obvious to one of ordinary skill in the art at the time of the claimed invention to adopt a "two-conductive-materials-for-the-interconnect" in the test structure in Graas et al., when exploring the suggestion of Hoang et al.:

Hoang et al. disclose an example of two conductive materials for a conductive runner having two parallel conductive paths, such that the resultant runners of two conductive materials have "added robustness" (p. 388, last sentence). At the lead of Hoang et al, one of ordinary skill in the art would have been motivated to test interconnect schemes having two conductive materials to see if they are robust enough to avoid stress voiding. That is, while the metallization shown in Table 2 of Hoang et al. showed no defects, one of ordinary skill would be motivated to test alternative metallization schemes having more than one conductive material, to see how robust, and to avoid poor choices of interconnect metallization.

#### ***Response to Arguments***

4. Rejections under 35 USC 112 are withdrawn. Applicant's comments are noted [paper 9, p. 5].
5. Applicant's arguments with respect to prior art rejections in the previous action are persuasive.

Particularly, applicant's meaning of a "conductive runner" having "taps" is not equivalent to "segments of conductive runners" connected by "vias" that could act as taps [paper 9, p. 7, 3rd paragraph].

For an example of understanding, in U.S. 6,570,181 (to Graas et al.), the "long segments 12" can be viewed as each being equivalent to a "conductive runner having a length sufficient to develop axial stress above a threshold for nucleating voids for a technology in which the runner is fabricated" (i.e. can develop stress-induced voiding in the technology represented per Background of the Invention and col. 1, line 32).

Yet, based on applicant's meaning of "conductive runner having taps," Graas et al. fails to disclose intermediate "taps" in any "runner 12," and only discloses: taps 20 at ends of the conductive runners 12, and taps 26 intermediate the chain of conductive runners (such as intermediate tap 26 for the conductive runner 12 chain linked by via holes 16 and short links 14).

6. Applicant's arguments with respect to the rejections of claims 1-41 in the last Office Action are persuasive. Therefore, the rejections have been withdrawn.

7. Applicant's arguments with respect to claims 42 and 43 have been considered but are moot in view of the new grounds of rejection.

***Allowable Subject Matter***

8. Claims 1-41 are allowed.

9. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 1-33, the prior art does not disclose a device (or structure) for nucleating voids (i.e. testing for stress-induced voiding) wherein a conductive runner has a length sufficient to develop axial stress for nucleating voids and wherein the runner is provided with taps at uniform impedance intervals.

Regarding claims 34-41, the prior art does not disclose the claimed methodology for using the structure of claims 1-33, particularly characterized by the act of normalizing measured impedance among tap intervals along the conductive runner.

### ***Conclusion***

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Evan Pert whose telephone number is 703-306-5689. The examiner can normally be reached on M-F (7:30AM-3:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on 703-308-1233. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 308-0956.

ETP  
September 22, 2003

A handwritten signature in black ink, appearing to read 'E. Pert'.

**EVAN PERT  
PRIMARY EXAMINER**